13.51: Cell-Mediated Immune Response

Do cells really attack other cells?

They sure do. Depicted here is a group of T cells attacking a cancer cell. When they can, the T cells search out and destroy “bad” cells.

Cell-Mediated Immune Response

In addition to the humoral response, the other type of immune response is the cell-mediated immune response, which involves mainly T cells. It leads to the destruction of cells that are infected with viruses. Some cancer cells are also destroyed in this way. There are several different types of T cells involved in a cell-mediated immune response, including helper, cytotoxic, and regulatory T cells.
T Cell Activation

All three types of T cells must be activated by an antigen before they can fight an infection or cancer. T cell activation is illustrated in Figure below. It begins when a B cell or nonspecific leukocyte engulfs a virus and displays its antigens. When the T cell encounters the matching antigen on a leukocyte, it becomes activated. What happens next depends on which type of T cell it is.

Helper T Cells

Helper T cells are like the “managers” of the immune response. They secrete cytokines, which activate or control the activities of other lymphocytes. Most helper T cells die out once a pathogen has been cleared from the body, but a few remain as memory cells. These memory cells are ready to produce large numbers of antigen-specific helper T cells like themselves if they are exposed to the same antigen in the future.

Cytotoxic T Cells

Cytotoxic T cells destroy virus-infected cells and some cancer cells. Once activated, a cytotoxic T cell divides rapidly and produces an “army” of cells identical to itself. These cells travel throughout the body “searching” for more cells to destroy. Figure below shows how a cytotoxic T cell destroys a body cell infected with viruses. This T cell releases toxins that form pores in the membrane of the infected cell. This causes the cell to burst, destroying both the cell and the viruses inside it.
A cytotoxic T cell releases toxins that destroy an infected body cell and the viruses it contains.

After an infection has been brought under control, most cytotoxic T cells die off. However, a few remain as memory cells. If the same pathogen enters the body again, the memory cells mount a rapid immune response. They quickly produce many copies of cytotoxic T cells specific to the antigen of that pathogen.

**Regulatory T Cells**

Regulatory T cells are responsible for ending the cell-mediated immune response after an infection has been curbed. They also suppress T cells that mistakenly react against self antigens. What might happen if these T cells were not suppressed?

---

A cytotoxic T cell releases toxins that destroy an infected body cell and the viruses it contains.

After an infection has been brought under control, most cytotoxic T cells die off. However, a few remain as memory cells. If the same pathogen enters the body again, the memory cells mount a rapid immune response. They quickly produce many copies of cytotoxic T cells specific to the antigen of that pathogen.

**Regulatory T Cells**

Regulatory T cells are responsible for ending the cell-mediated immune response after an infection has been curbed. They also suppress T cells that mistakenly react against self antigens. What might happen if these T cells were not suppressed?
Summary

- Activated T cells destroy certain cancer cells and cells infected by viruses.
- Memory T cells remain in the body after the immune response and provide antigen-specific immunity to the virus.

Review

1. Describe one way that cytotoxic T cells destroy cells infected with viruses.
2. What are regulatory T cells?

Resources

Media, iframe, embed and object tags are not supported inside of a PDF.